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ABSTRACT

This paper describes the aquaculture program developed at Inverness College in Scotland. Inverness is located in the Scottish Highlands and serves an area roughly the size of Belgium, but with a population of only 300,000. The regional infrastructure and human capital resources in the Highlands are relatively weak due to inadequate transportation, seasonal employment markets, high unemployment, and relatively low workforce skills. The region relies heavily on the service and tourism industries. No place in the Scottish Highlands is more than 50 miles from the sea, and fish farming and aquaculture have traditionally supplied a large percentage of the economic base. Though in decline, these sectors are still important in remote and rural highland areas. Inverness College has expanded its Aquaculture Program (in the Environmental and Natural Sciences departments) to include a distance learning program that serves these rural communities. The budget for the program is 96,000 British pounds (U.S. $139,000), and in 2000 it served 23 participants, with 15 more being recruited. The average age of students is 19, but demand by older workers is increasing. All participants have been male. Inverness College has identified a potential market for the course throughout Europe and elsewhere. The College is ready to embark on further developments using both CD-ROM and the Internet. (NB)

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1

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ED 467 205

Inverness College: Innovations in Aquaculture Training

Inverness College, the largest college in the Scottish Highland and Island regions, has a student population of around 9,000 students. Funded by the Education Funding Council, Inverness delivers a range of courses from Intermediate to Higher Skill qualifications, National Certificates, Diplomas, and Degrees. It offers a broad curriculum, including Business Studies, Hospitality and Tourism, Hairdressing and Beauty Therapy, Engineering and Computing, Environmental and Natural Sciences, Building and Construction, Arts, Culture and Heritage, Social Studies and Supported Learning. Inverness serves an area that is roughly the size of Belgium, but its regional population is only 300,000.

The regional infrastructure and human capital resources in the Highlands are relatively weak due to inadequate transportation, seasonal employment markets, high unemployment, and relatively low workforce skills. No place in the Scottish Highlands is more than 50 miles from the sea, and the area is one of mountains, rivers, lochs and coastline. Home to many species of sea birds, salmon and trout, the Highlands are rural and continually struggle to grow the manufacturing base. Thirty-six percent of the population is located in the city of Inverness, the regional capital. The region's employment relies heavily on the service and tourism industries. Regional industries that can capitalize on the Highland's resources and provide a source of local employment are in need of support.

Agriculture, Aquaculture & Natural Resources

Based upon the area's rich natural resources, fish farming and aquaculture have traditionally supplied a large percentage of the economic base. The industrial practices in the region's fish farming and aquaculture are unique. Though in decline, these sectors are still important employers in remote and rural highland areas. An indicator of the past importance of these sectors is the extent to which separate aquatic-based industries developed in the region. The two most prominent of these industries are sea fishing and aquaculture.

Though both industries rely on the same resources and are located in the same geographic area, there are distinguishable differences between them. Sea fishing is concerned with the construction of harbors and piers, as well as sites to promote the marketing and processing of fish. Industry upgrades and modernization are regularly scheduled, and a careful watch of resources supply is maintained. Aquaculture can be defined as "the cultivation of the natural produce of water" (such as fish or shellfish). The industry invests primarily in farmed salmon, as well as other breeds suitable for cultivation (e.g. halibut, trout, scallops, etc). Investors in aquaculture maintain careful watch over the market that is serviced by cultivated fish, as well as any environmental or economic influences upon this market.

With the exponential growth of the human population, the capture of naturally occurring fish populations is becoming increasingly non-viable. It is estimated that current levels of deep-sea fishing will not be sustainable beyond the year 2040, because fish stocks will have been depleted. As awareness of this increases and government pressure limits fishing, aquaculture stocks are becoming more important.

The Program

Inverness College has offered a program in aquaculture in the Environmental and Natural Sciences departments since 1991. However, the distance to Inverness for those living in the region's rural areas and the time required to be a full-time student are often prohibitive.

To help overcome these obstacles, and in cooperation with the Scottish Qualifications Authority, Inverness College has implemented a distance

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Milestones

1998 The development of a flexible learning materials for the SVQ level 2 in Aquaculture. This development enabled individuals working in remote areas throughout the Highlands to access training, and was completed by the end of December 1999. Funded by the College and the European Social Fund.

1999 The development of the SVQ 2 Aquaculture curriculum on-line and on CD-ROM. This was developed following feedback from the people working in the industry. The college was committed to providing the most up-to-date learning experience for individuals living and working in the Highlands. The development of the on-line learning facility provided 21st century learning to an important economic area in the Highlands. This was achieved by the end of December 2000. This project was funded by the College and the European Social Fund.

Following the development of the SVQ 2000 through flexible learning and on-line it was important for the college to develop the next level. This allowed participants to articulate to a higher level qualification. The first stage was to develop the SVQ 3 (upper level) program through flexible learning. This was achieved. This project was funded by the College and the European Social Fund. The first cohort of students began in October 2000.

Further cohort of 15 students to begin the Level 2. Development of the upper level courses on line. This project was funded by the College and the European Social Fund.

learning program, making acquisition of skills training accessible across the remote regions of Northwest Scotland. This program allows participants to take part in rigorous training for aquaculture from their home site or place of work. Participants also can be observed and assessed at their work place. Such an arrangement benefits the participant as well as the employer, who gains better qualified staff with a minimum of lost work time.

The college has a number of outreach sites across the Highlands. These include Dingwall, Aviemore, Portree, Balintore, Ullapool, Eigg, Fort Williams, and Mallaig. The major center for aquaculture training is the Seafield Centre, set up in Kishorn in 1991 for the sole purpose of improving such training, for both the College and industry. The centre has developed to include a number of facilities for on-growing various fish species, including salmon, trout, mussels, oysters and scallops for commercial purposes as well as management of world native stocks. Located on the banks of Loch Kishorn in Wester Ross with idyllic surrounding and views out to Skye, the Seafield Centre has gained recognition throughout the Aquaculture Industry and Europe.

The Seafield Centre provides several qualifications through its programs. Full time programs include: National Certificate Fish Farming, Higher National Certificate Fish Farming, and Production Management. Part-time programs are the SVQ2 Aquaculture and SVQ3 Aquaculture work-based initiatives. The budget for the aquaculture distance-learning program is UK 96,000 (US $139,000). At the end of 2000, there were 23 participants, all of whom worked full-time in industry.

The program is funded through Inverness College and the Highlands & Islands Partnership Programs Objective 1 funding, a program specializing in helping businesses and communities in sparsely populated remote communities develop and become self-sustaining. The Scottish Qualification Authority (SQA) and the Scottish Further Education Unit (SFEU) provide national input for the program, ensuring that the program results in nationally recognized credentials. Rocket Visuals, a private company provides technical expertise, including the development of online materials. Additionally, the initiative was developed in close consultation with industry. Owners and workers from industry participated in the ongoing development of the program to ensure a user-friendly curriculum and delivery mechanism.

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Course development

The origin of the effort stemmed from a recognition that many aquaculture workers spread across the region were not taking advantage of the college's fishery programs because they had difficulty getting to the college's facilities. In response, they put together a project team and, with student input created an online curriculum.

The development team identified an appropriate methodology to meet these needs, as outlined below.

Course methodology

Timing, duration and pace

The course is structured to enable students to participate in learning at a time and pace suitable to their individual circumstances. The online components provide all the underpinning skills and knowledge required to achieve the award.

Since the course is competence-based no time is set for achievement. Learners may take as long as they wish. At present they are averaging about nine months, with a minimum of six months.

Evidence

Knowledge components are evaluated through online assessment and questioning in the workplace, and supplemented through project work. Practical evidence on competence is generated in the workplace through the presentation of a portfolio including workplace testimony, photographs, products, and self-assessments.

Workplace Competence

The candidate demonstrates underpinning skills and knowledge as well as practical skills, and thus learners are required to demonstrate competence in the workplace.

Combining methodology with new technology

Different media modes will be created for learning: paper based, online and on a CD-ROM, enabling the students to make their own choices. The College takes the view that not only do students have learning preferences, but also the situation in which they are learning will have implications for the choice of learning media.

All learning is topic-based to reduce the amount of drilling down for information by each learner.

The essential knowledge aspects of a course are clearly distinguishable from the individual research contribution by students. This enables both participative involvement and the use of resources as a knowledge base.

Support

Support to the learner is offered both online and face-to-face.

Assessment and accreditation

Assessment is on demand. Those who wish to be assessed can avail themselves of the assessment service when they feel ready.

Assessment is not obligatory. Many learners may wish to learn for reasons other than gaining accreditation. Others may feel more confident about embarking when they know they have a choice about being assessed.

Accreditation is compatible with the Scottish Vocational Qualifications infrastructure, to enable further professional development.

The Aquaculture Courses: Structure and Practice

The Courses in this series pertain to various aquatic produce including salmon, trout, scallops, mussels and oysters. They are similarly structured and each includes: a background to the particular produce, the husbandry environment, grading equipment, harvesting and transportation of produce, caring for young specimens, produce reproduction, supporting farm operations, and farm health and safety.

At the end of December 2000 there were 23 individuals undertaking the SVQ Level 2 in Aquaculture. The college was recruiting 15 more to the course. The average age of students is around 19, but demand by older workers is increasing as they see younger colleagues gaining competence. All beneficiaries to date have been male, and the majority has little, if any, college experience. Students take the courses from locations ranging from offices to fish sheds, to individuals' homes. A problem is that some fish farms and homes are not yet equipped for Internet access, and some workplaces do not have computers. Participants can also utilize the facilities at the Centre, which has a full IT suite. The venue for practical assessment is the workplace.

The first stage of developing and implementing learning materials for the fish farming industry has been completed, with the production of a CD-ROM, as well as the second stage of establishing an Internet-based learning site. A secondary project is

now underway to enhance the Internet learning site to include SVQ Level 3 in Aquaculture.

A support lecturer travels to each learner, both to assess progress and to offer support. Because of the dispersion of the students, the lecturer may spend a whole day traveling to see a student and then travel another day to get back to College. This cost will need to be acknowledged in future developments.

The current qualification is a SVQ at Level 2 in Aquaculture and is accredited by the Scottish Qualifications Authority. The Certificate is a route for career development in the fish farming industry. Ongoing assessment is made up of the portfolio coupled with on-site assessment at fish farms throughout the Highlands. Since at present the SQA is not able to accept online assessment, the final examination takes place at Inverness College.

Benefits

Students in the courses have realized several benefits. Primarily, learners do not have to be close to the College to participate. They are motivated to learn and to get training, and this can improve self-esteem. The program's greatest strength is its ability to accommodate participants who want to expand their qualifications as well as to develop the aquaculture industry. Mainstream students who are studying related courses now take advantage of the opportunity to reinforce and expand their knowledge by using the distance learning model both in its own right and as a revision aid. The development for the SVQ 3 is ongoing and will be ready for those who are about to complete their level 2 qualifications.

For the College, benefits have also been gained. The program would be easy to modify according to other industry standards, and thus replicated. By using a project team that included a subject specialist and a production specialist, the college was able to put into operation such a specialized on-line course of study in a relatively short period of time. In the industrial sector, employers who had no previous involvement in training are now embracing it. Employers no longer have to lose people for days at a time while they go elsewhere to get training.

For the Region, both the physical and training infrastructure of the region have been developed further. An industry that is not thriving has been assisted. This type of innovative, technology-based learning program serves residents of remote areas and industries.

Challenges

Some students demonstrate an unwillingness to use computers, and this attitude is proving difficult to resolve remotely.

Most learners are the sole students in their business, and the lack of co-student support is visible at times.

Using CDs as opposed to the web means that the currency of information remains a challenge, particularly in those areas involving the latest information on fish disease and on European Union directives.

The outstanding hurdle for the marketing of the site on the web is development of systems to support candidates in other geographic locations.

The funders will need to assist developers in ensuring that further developments are sustainable, or to earmark future funds for support.

Long Term Prospects

Research Program Development

The College has identified a potential market for the course throughout Europe and elsewhere. A Northern Periphery Project, "The Case for Salmon" involves Inverness College with colleagues in Norway and Finland working on Coastal Zone Management, and gives the College access to wider markets. Because the course is topic-based, and the knowledge base is separate from each student's research, an opportunity now exists for the College to market specialized topic-based add-on, and stand-alone modules independently, either as a learning tool or as a reference medium. One module under consideration would cover Infectious Salmon Anaemia (ISA).

Learning Resource Development

The College has learned a great deal about transfer from print to digital media, and is ready to embark on further developments using both CD-ROM and the web. Experience shows that materials should be as uncluttered as possible, to assist in clarity for the learner. When using hyper-links, either on a CD-ROM or on the web, developers at Inverness College recommend setting drill-down limits and having the hardest-to-access information be that which only the most committed student would want to access.

Partnership with Industry

It was important to consult with the fish farms both at the beginning of the development and at every

stage in its progress. This new and strong partnership is likely to have further benefits for both parties. The feedback from each cohort of students and their employers has led to continual improvement both in content and in methodology.

External Course Evaluation: Strengths, Weaknesses, Opportunities, and Threats

Strengths

This is the only aquaculture training available in the region. It provides an innovative framework within the sector. The College is teaching facilitators to deliver this training, thus increasing professional capacity. The students value the onsite support from the tutor who travels from learner to learner as required. Students welcome the portfolio approach of building evidence since it recognizes their experience in the industry. Upper level courses (SVQ Level 3) were being developed in 2001, which will allow students to continue learning new skills.

Weaknesses

Although the region has had a good reputation for information and Communications Technology (ICT) Infrastructure, there are still numerous pockets where it is difficult and/or expensive to access high speed internet capability such as an ISDN line. There are some aquaculture businesses where an onsite computer is not yet a business necessity.

Opportunities

Because of the onsite learning, and the regular visits from the assessor, employers are gaining more exposure to learning and its positive impact on profitability. Students, their colleagues, employers, families and friends have been stimulated to take further advantage of life-long learning.

Threats

Distance education from other sources

The very problem that Inverness College has set out to overcome, that of distance, also leads to a significant problem, that competitors could, with relative ease, break into the same market. As an educational provider Inverness College must balance its own need for students against its desire to encourage a greater uptake of life-long learning from other sources. The SQA's current inability to endorse online assessment may also hold back initiatives such as this in the international market.

Economic issues

The aquaculture course is operating in a difficult economic environment. Because of access issues, the support mechanism is crucial but expensive. The future of the course will depend on the sustainability of enrollment, which, in turn, depends on the sustainability of the industry. The aquaculture industry is under a dual threat of disease and EU directives. Most businesses in the area are small, and thus fragile. If the aquaculture sector fails, then the opportunity for Inverness College's course locally will be significantly affected. To date, no student or employer has been charged for the service. The College will have to identify a possible change in demand when costs are implemented.

Benchmarking

This project is deemed to be a benchmark practice because it could be a role model for many other industries that are by nature indigenous to regions rich in natural resources. In a national or a global context, the methodology could be applied to other sectors. A valuable aspect of the initiative is the way in which it approaches assessment and accreditation. The voluntary nature of assessment makes a significant contribution to the raising of self-esteem, as does the recognition of existing skills. At the same time, those who wish can receive accreditation within a national framework. It is hoped that a further outcome of the program would be to work with the SQA to enable online assessment.

The innovative aspect of the program includes the close liaison with industry and employers. The benefits of this innovation accrue to employers and colleagues as well as to the learners themselves. An important side effect is the raising of IT awareness throughout an under-computerized sector. The program stands out because it was developed in a very short time to meet needs caused by geography and distance. The program's intention to be as interactive and participative as possible distinguishes it from other digitally-based offerings.

Conclusion

This is a significant development for the College as it is the first curriculum area to be put online. As a result, the professional development of those involved has been enhanced and future opportunities

beckon. Demand for the program should rise, since students benefit with career options and advancement, industries with better qualified employees, and the local economy with more efficient production.

The partnership elements of the initiative are likely to continue to have benefits for this region and the experience of dealing with distance disadvantage may make Inverness College well placed to compete in a global market of vocational distance education. Heather Dunk of the SFEU sums up the project by saying, "The project succeeds in its articulated aim to help people access something that was previously impossible, and at the same time demonstrates what can be achieved by using technology in rural areas."

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